Optima RCM User Guide Supplement for MES 802 RCM Simulator

What the Simulator Does and Doesn't Do

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Introduction

This document discusses details unique to the MES 802 Optima RCM Simulator. You will also need the RCM User Guide, and perhaps other documents which are available from http://www.marway.com/docs/.

Setup

Follow the same setup instructions defined in the Getting Started chapter of the RCM User Guide.

Objective

The intended purpose of the RCM Simulator is to aid system programmers in developing integration software for Marway's Optima RCM power distribution units. The simulator uses an Optima RCM production main logic board, and a production release of the firmware modified in just a few places to allow the simulation of power data and outlet switching. While use of the simulator may not enable you to create 100% of the production code you need due to model differences, the purpose of the simulator is to help you learn, practice, and develop the software patterns you'll need for your final PDU integration code.

Capabilities

- Fully functional RCM user interfaces for power data, environment data, setpoints, event alert assignments, logging, user configuration, network configuration, and more.
- Fully functional remotely programmable interfaces including HTTP, Telnet, SNMP, RESTful API, and the serial console.
- Fully functional multiple user configuration to segregate human and scripted clients.
- Simulated data for Volts, Amps, Watts, VA, VAR, Hz, and PF.
- Simulated outlet switching.
- Actual temperature/humidity data from probes connected to Aux1 and Aux2 ports.
- Working keypad and display.
- Working protocols for time (SNTP), and sending alerts (SMTP).
- Working HTTPS configuration using signed certificates (details at http://www.marway.com/docs/).

Limitations

- Inlet voltage and current data are automatically derived from the ratings of the simulated PDU product, and cannot be manually set to a user-preferred value or range.
- The rest of the power data (W, VA, VAR, etc.) are rough estimates in the realm of plausibility just to have some data to work with, but are not attempting to make 100% mathematical sense.
- Outlet on/off is relevant only to the switch state itself. Turning outlets on/off will not change the inlet current value. Setting them all off will not set the inlet current to zero.
- There is not a way to simulate the behavior/results of EPO events.

System Overview

The physical unit is quite simple. The RCM logic board is housed in a desktop enclosure with the front panel providing everything necessary to operate the unit. The system should have been delivered with a small "wall wart" power adaptor. Additionally, a USB to RJ45 serial cable should have been included which is needed for initial setup. Details on initial setup and this cable are in the first chapter of the RCM User Guide documentation.

12 Vdc Power Input

Should the original power adaptor get lost, anything providing 12 Vdc of at least a half amp, and matching the connector size will work.

On/Off Switch

Provides power to the logic board. Can be used to power cycle the unit if needed, though typically a software restart command would be used, or even the Hardware Reboot button could be used as well.

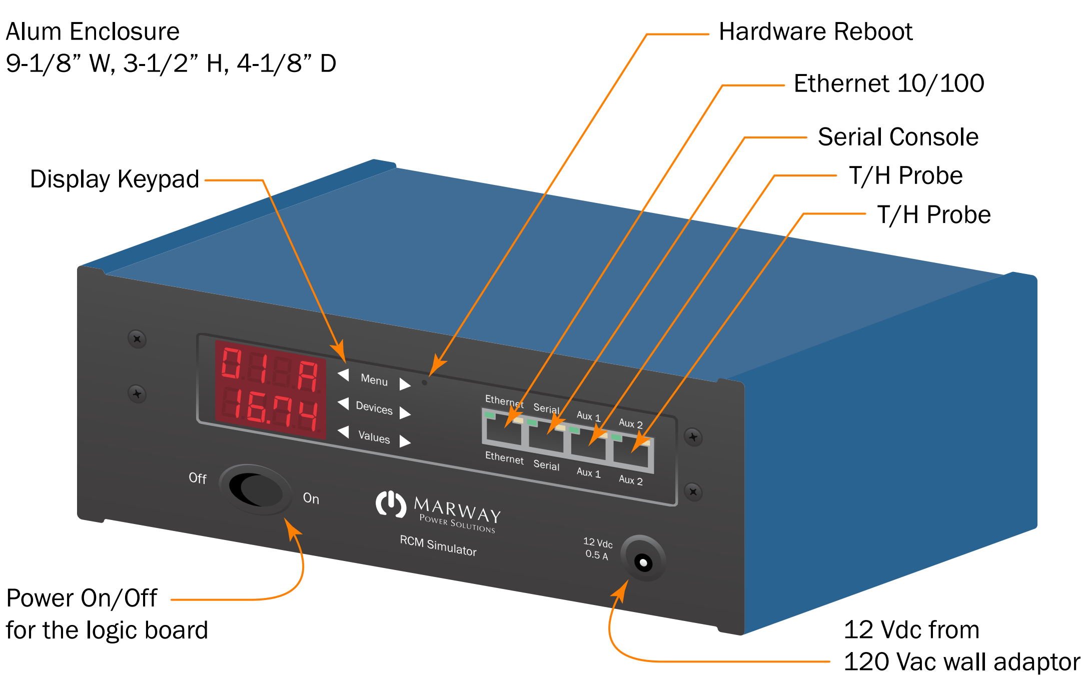
Hardware Reboot

Generates a microprocessor reset. For this unit, this is essentially the same as a software restart command. On a real PDU, this would also restart the firmware on additional internal boards such a power monitoring boards and relay boards.

- In a real PDU, a software `restart` command will not disable outlets during software startup.
- In a real PDU, pressing the Hardware Reboot button **WILL** disable outlets during software startup. This is essentially the same as a power cycle, but likely easier to initiate than removing and restoring inlet power.

Ethernet

Standard RJ-45, 10/100T connection. Do not use a crossover cable.



Serial

Connecting to serial is required for the initial setup. It also provides a convenient command line console for use during development. The RCM User Guide provides all setup information, as well as information for using the serial command line. Use the USB to RJ45 cable shipped with the unit (details are in the User Guide).

Aux 1 and Aux 2

These are connections for combined temperature and humidity ("T/H") probes—one probe per port. These are actually fully functional, and the simulator requires a probe be connected in order to generate T/H data. When connected, the web interface Dashboard includes an extra panel to show the data.

Requiring real probes vs. simulating T/H data was chosen because most systems tend to be used without these probes. With simulated data, the dashboard and other user interfaces would have had extra data and information visible that may get in the way of creating programming and documentation (think screen shots).

Data Generation

As outlined in the *Introduction, Limitations* section, in this version of the Simulator, the power data value or range cannot be specified by the user. All data is automated. Values will change about every 3 seconds (the actual time can vary, and may be a slightly shorter interval in the simulator than in a real PDU). A good rule of thumb for polling the PDU for new power data is about every 4 seconds (T/H data about every 30 seconds) as a starting point, and if needed, try for shorter intervals from there.

The simulator is derived from a special build of the software used by the software team where the simple availabilty of a non-zero value is good enough. There's no effort here to have the various power data values make mathematical sense as a set. However, to help you understand what you're seeing, the values are explained below.

- Volts — the root value is determined by the rating of the input of the PDU model being simulated. A 120 single phase or 120/208 3-phase inlet will use 120 volts as the root. A 200-240 Vac inlet will use 240 volts as the root. The value will vary on each update (every few seconds). The variance formula is (root voltage x 0.99) + (a random value from 1 to 4).
- Amps — is a simple variation from 62% to 75% of the maximum rating of the input.
- Watts — is simply (volts x amps) of that simulated cycle.
- VA — is always 98% of watts.
- VAR — is (watts – voltamps).
- Power Factor — is always 0.98.
- Hertz — is always 59.9.

Experimenting with Setpoint Alarms

Setpoints are available for volts and for amps. Some experimentation with setpoints is possible so that you can at least see the impact of having an alarm triggered, and alerts broadcast. There are limitations though. To explain what's possible, let's explore a scenario with amps.

A common purpose for monitoring amps is to warn someone if the load is close to the limit of the breaker. Since amps in the simulator are calculated between 62% and 75% of the maximum rating, you won't be able to play with a value which is in fact very close to the breaker limit. What you can do is set the high warning or high critical setpoint to some number in that 62–75% range (which is 18.6 to 22.5 for a 30 A system). Eventually the simulator will generate a number exceeding your setpoint (don't use a setpoint of 75% because nothing larger will be generated).

An alarm will be triggered, and if configured in Alerts settings, an alert can be sent by email or TXT to a user. See the User Guide for the settings used to do this.

This will at least allow the programmer to become familar with how to configure setpoints and alerts at the basic level. Another limitation is that since you can't control the current data profile over time, in this version, there is limited ability in experimenting with the debounce and hysteresis values—though debounce is easier to experiment with than hysteresis.

About the Optima RCM 833 Simulated Model

Your simulator model may have been programmed to emulate a specific PDU. However, the default PDU simulated is MPD 833012-PSW-000. This is reported as an MPX unit in the software to clarify (particularly for remote queries) that it is a simulation.

The Model Includes

- Three-phase input, 120/208 Wye, 30 amps.
- 15 switched outlets
- 2 always on convenience outlets
- EPO

Simulation Adapation To Other Model Features

The purpose of the simulator is to help you learn, practice, and develop the software patterns you'll need for your final PDU code. If the PDU you will ultimately be using has different features than the one in the simulator, in general there will be some details you'll have to modify once you have a working PDU available to interface with. The complexity of those adapatations will depend on whether you're writing code dedicated to one PDU model (where you might choose to hard code some details), or whether you're writing code to help your organization manage multiple models od PDUs where you may need to code for more flexibility.

Below are some general things to keep in mind, and some ideas for adapting.

Single Phase Inputs

When the simulator is a three-phase model, but your target model is a single phase:

- There's no impact to most CLI commands (serial, telnet, ssh), as commands require the ID of the phase to be read or written to. If your unit is single phase, you only need to be concerned with ID = 1. You can ignore the fact that are two additional phases available.
- CLI commands which would be affected, but aren't likely to be used for remote programming:
  - The plural `#> getPhases` and `#> getOutlets` commands. Here, any processing would have to account for multiple lines. However the same data is available in much better form from other commands.
- Of course, the reported Phase Label will not always be LN like you expect for a single phase, but this data should be for display only, and likely not used for decision making.
- For the RESTful API, again, you'll be providing the phase ID, so it will be possible to ignore those > 1.
- For SNMP, querying the PDU will generate more rows in tables that you'll get with single phase. However, the primary individual get/set objects, like the other interfaces, you can ignore the RCM object IDs > 1.

Different Voltage or Current Rating

If your code is going to provide input validation, you may be wanting to code limits on the input values.

- Rather than depend on fixed limits, it may be best for your code to first query the PDU to discover the limits. Then, there won't be any need to alter code for a specific PDU. This can be done by reading the rating values of the phases.

Different Outlet Count or Types

- In terms of outlet count, much like the phase count, most commands to read or write to an outlet involves providing the outlet ID. Your code can ignore IDs greater than the outlet count of your target PDU.
- All settings for outlets (delays, Startup State, and others) are the same regardless of the type of outlet—whether it's a NEMA type, an IEC type, single phase, or multi-phase.
- On/Off commands are the same regardless of whether the internal relay is used to directly switch a 5-15 outlet, or trigger a separate contactor for a 3-phase outlet.
- If your target PDU has more outlets than the simulator has, you'll have to wait until being connected to the PDU to try the extra outlets. Sending an on/off or settings change command to outlet 22, for example, when the simulator has only 17 outlets will result in error message responses.

EPO

- From the software perspective, having an EPO option is mostly visible in haveing the EPO Alerts configuration available, and the Auto On When EPO Cancelled option for outlets.
- If your PDU will not have the EPO option, you would just ignore the available configuration options in your programming efforts.
- In this simulator version, there is no way to trigger an EPO event to experiment with how the software behaves. A real PDU will be needed for that.

Change Notes

Revision 2 • September 16, 2020

- Added Marway Part Number
- Updated documentation URLs

Revision 1 • June 29, 2020

- Initial Release